HEAT-DISSIPATING FAN DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a fan device, more particularly to a heat-dissipating fan device.

2. Description of the Related Art

Figure 1 illustrates a conventional heat-dissipating fan device 1 that includes a fan housing 10 and a fan impeller 12. The fan housing 10 has a top wall 13 formed with an inlet 131, a bottom wall 14, and a side wall 11 transverse to the top and bottom walls 13, 14 and formed with an outlet 111. The top, bottom and side walls 13, 14, 11 confine a receiving space 15. The fan impeller 12 is mounted in the receiving space 14 of the fan housing 10.

Referring to Figures 2 to 4, the fan impeller 12 includes a hub cap 121, a plurality of coupling ribs 122, a first connecting ring 125, a second connecting ring 124, and a plurality of fan blades 123. The hub cap 121 has opposite upper and lower portions 1211, 1212. The coupling ribs 122 extend radially and outwardly from the lower portion 1212 of the hub cap 121 (see Figure 4), and are spaced apart angularly from each other (see Figure 3). The first connecting ring 125 is disposed coaxially around the lower portion 1212 of the hub cap 121, and is connected to the coupling ribs 122. The second connecting ring 124 is disposed coaxially around

the upper portion 1211 of the hub cap 121. The fan blades 123 are spaced apart angularly from each other (see Figure 3). Each fan blade 123 extends radially, and is connected to and is disposed uprightly on the first connecting ring 125. Each fan blade 123 has an outer lateral edge connected to the second connecting ring 124. As such, rotation of the fan impeller 12 draws air to flow from the inlet 131 of the fan housing 10 toward the outlet 111 of the fan housing 10.

However, during rotation of the fan impeller 12, air drawn into the receiving space 15 initially flows downwardly toward the bottom wall 14 of the fan housing 10, and is subsequently directed to flow radially toward the outlet 111 of the fan housing 10 such that the conventional heat-dissipating device 1 cannot generate a stable airflow amount as a result of airflow disturbance in the receiving space 15 of the fan housing 10. Furthermore, the second connecting ring 124 obstructs airflow through the outlet 111.

SUMMARY OF THE INVENTION

Therefore, the object of the present invention is to provide a heat-dissipating fan device that can generate an enhanced airflow amount.

According to one aspect of the present invention, a heat-dissipating fan device comprises:

a fan housing confining a receiving space and including a top wall, and a side wall transverse to the

top wall, the top wall being formed with an inlet for access into the receiving space, the side wall being formed with an outlet in fluid communication with the receiving space; and

a fan impeller mounted in the receiving space of the fan housing and rotatable about a central axis that is transverse to the top wall of the fan housing, the fan impeller including:

a hub cap having an outer surrounding surface that is disposed to surround the central axis, the hub cap having opposite upper and lower portions, and an intermediate portion interconnecting the upper and lower portions;

a plurality of coupling ribs extending radially and outwardly from the outer surrounding surface of the hub cap, and spaced apart angularly from each other, each of the coupling ribs having a first end connected to the outer surrounding surface of the hub cap, and a second end opposite to the first end;

a first connecting ring disposed coaxially around the intermediate portion of the hub cap, the first connecting ring being connected to the second ends of the coupling ribs;

a second connecting ring disposed coaxially around the lower portion of the hub cap, the second connecting ring having a diameter larger than that of the first connecting ring; and

a plurality of fan blades spaced apart angularly from each other, each of the fan blades having a first blade body connected to and disposed uprightly on the first connecting ring, and a second blade body connected to and extending radially from the first blade body, the second blade body having a bottom end connected to the second connecting ring, each adjacent pair of the fan blades confining an air passage therebetween.

Rotation of the fan impeller draws air to flow from the inlet of the fan housing toward the outlet of the fan housing through the air passages.

According to another aspect of the present invention, a fan impeller comprises:

a hub cap having an outer surrounding surface that is disposed to surround a central axis, the hub cap having opposite upper and lower portions, and an intermediate portion interconnecting the upper and lower portions;

a plurality of coupling ribs extending radially and outwardly from the outer surrounding surface of the hub cap, and spaced apart angularly from each other, each of the coupling ribs having a first end connected to the outer surrounding surface of the hub cap, and a second end opposite to the first end;

a first connecting ring disposed coaxially around the intermediate portion of the hub cap, the first connecting ring being connected to the second ends of the coupling ribs;

a second connecting ring disposed coaxially around the lower portion of the hub cap, the second connecting ring having a diameter larger than that of the first connecting ring; and

a plurality of fan blades spaced apart angularly from each other, each of the fan blades having a first blade body connected to and disposed uprightly on the first connecting ring, and a second blade body connected to and extending radially from the first blade body, the second blade body having a bottom end connected to the second connecting ring, each adjacent pair of the fan blades confining an air passage therebetween.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiments with reference to the accompanying drawings, of which:

Figure 1 is a perspective view of a conventional heat-dissipating fan device;

Figure 2 is a perspective view of a fan impeller of the conventional heat-dissipating fan device;

Figure 3 is a schematic top view of the fan impeller of Figure 2;

Figure 4 is a schematic sectional view of the fan impeller of Figure 2;

Figure 5 is a perspective view showing the first preferred embodiment of a heat-dissipating fan device

according to this invention;

Figure 6 is a perspective view showing a fan impeller of the first preferred embodiment;

Figure 7 is a schematic top view showing the fan impeller of the first preferred embodiment;

Figure 8 is a schematic sectional view showing the fan impeller of the first preferred embodiment;

Figure 9 is a plot showing experimental results of wind pressure generated by the conventional heat-dissipating fan device and the first preferred embodiment; and

Figure 10 is a perspective view showing the second preferred embodiment of a heat-dissipating fan device according to this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Before the present invention is described in greater detail, it should be noted that like elements are denoted by the same reference numerals throughout the disclosure.

Referring to Figure 5, the first preferred embodiment of a heat-dissipating fan device according to the present invention is shown to include a fan housing 2 and a fan impeller 3.

The fan housing 2 confines a receiving space 210, and includes a top wall 21, and a side wall 24 transverse to the top wall 21. The top wall 21 is formed with an inlet 22 for access into the receiving space 210. The

side wall 24 is formed with an outlet 23 in fluid communication with the receiving space 210.

The fan impeller 3 is mounted in the receiving space 210 of the fan housing 2, and is rotatable about a central axis (A) that is transverse to the top wall 21 of the fan housing. Referring to Figures 6 to 8, the fan impeller 3 includes a hub cap 30, a plurality of coupling ribs 34, a first connecting ring 33, a second connecting ring 32, and a plurality of fan blades 35.

As shown in Figure 8, the hub cap 30 has an outer surrounding surface 31 that is disposed to surround the central axis (A). The hub cap 30 has opposite upper and lower portions 301, 302, and an intermediate portion 303 interconnecting the upper and lower portions 301, 302.

The coupling ribs 34 extend radially and outwardly from the outer surrounding surface 31 of the hub cap 30, and are spaced apart angularly from each other, as best shown in Figure 7. Each of the coupling ribs 34 has a first end 341 connected to the outer surrounding surface 31 of the hub cap 30, and a second end 342 opposite to the first end 341. In this embodiment, the first end 341 of each coupling rib 34 is connected to the lower portion 302 of the hub cap 30. Each coupling rib 34 curves upwardly from the outer surrounding surface 30 of the hub cap 31 (see Figure 8).

As shown in Figure 8, the first connecting ring 33

is disposed coaxially around the intermediate portion 303 of the hub cap 30. The first connecting ring 34 is connected to the second ends 342 of the coupling ribs 34. In this embodiment, the first connecting ring 33 has a bottom surface 331 connected to the second ends 342 of the coupling ribs 34, and a radially and downwardly inclined top surface 332 (see Figure 8).

The second connecting ring 32 is disposed coaxially around the lower portion 302 of the hub cap 30, as shown in Figure 8. The second connecting ring 32 has a diameter larger than that of the first connecting ring 33.

The fan blades 35 are spaced apart angularly from each other, as shown in Figure 6. Each of the fan blades 35 has a first blade body 351 connected to and disposed uprightly on the inclined top surface 332 of the first connecting ring 33, and a second blade body 352 connected to and extending radially from the first blade body 351. The second blade body 352 of each fan blade 35 has a bottom end 3521 connected to the second connecting ring 32, as shown in Figure 8. Each adjacent pair of the fan blades 35 confine an air passage 353 therebetween, as shown in Figure 6. In this embodiment, each of the fan blades 35 has a curved cross section, as shown in Figure 7. Preferably, the first blade body 351 has a height that is substantially a third of that of the second blade body 352, and an arc length that is substantially a third of that of the second blade body 352.

In view of the aforesaid construction, rotation of the fan impeller 3 draws air to flow from the inlet 22 of the fan housing 2 toward the outlet 23 of the fan housing 2 through the air passages 353, as indicated by solid arrows in Figure 5.

It is noted that, due to the presence of the inclined top surface 332 of the first connecting ring 33 and the curved coupling ribs 34, air flowing from the inlet 22 of the fan housing 2 can be smoothly guided toward the outlet 23 of the fan housing 2, as indicated by the solid arrows in Figure 8. Therefore, wind resistance of airflow drawn into the receiving space 210 (see Figure 5) of the fan housing 2 can be reduced. Accordingly, the heat-dissipating fan device of this invention can generate enhanced airflow amount. Based on the experimental result shown in Figure 9, the heat-dissipating fan device of this invention can generate airflow with a wind pressure larger than that of the aforesaid conventional heat-dissipating fan device.

Figure 10 illustrates the second preferred embodiment of a heat-dissipating fan device according to this invention, which is a modification of the first preferred embodiment. In this embodiment, the fan housing 2' has a shape different from that of the fan housing 2 in the first preferred embodiment.

While the present invention has been described in

connection with what is considered the most practical and preferred embodiments, it is understood that this invention is not limited to the disclosed embodiments but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.